

## Patent claims

1. A process for coating surfaces of metallic objects, in particular as a pretreatment for cold shaping or as a pretreatment for a metal-rubber composite or for adjusting the coefficients of friction of connecting elements for use of these connecting elements, such as e.g. screws for screwing, characterized in that the metallic objects, which are optionally already precoated, are coated with an aqueous, acidic composition containing phosphate, which comprises
  - 8 to 50 g/l of phosphate, calculated as  $\text{PO}_4$ ,
  - 0.5 to 30 g/l of zinc ions,
  - 0 to 5 g/l of manganese ions,
  - 0 to 8 g/l of calcium ions,
  - 0 to 5 g/l of magnesium ions,wherein at least 0.1 g/l of calcium or/and magnesium ions are present,
  - 0.1 to 5 g/l of nitroguanidine,
  - 0.1 to 10 g/l in total of chlorate or/and peroxide ions,in total 0 to 16 g/l of complex fluoride ( $\text{MeF}_4$  or/and  $\text{MeF}_6$ ) of  $\text{Me} = \text{B}, \text{Si}, \text{Ti}, \text{Hf}$  or/and  $\text{Zr}$  and
  - 0 to 5 g/l of fluoride ionswherein the total content of complex fluoride and fluoride ions is in the range from 0.1 to 18 g/l.
2. A process according to claim 1, characterized in that the composition comprises not more than 1 g/l of nitrate or is largely or completely free from nitrate.
3. A process according to claim 1 or 2, characterized in that the composition comprises not more than 0.5 g/l of nitrite or is largely or completely free from nitrite.
4. A process according to one of the preceding claims, characterized in that the composition comprises complex fluoride or/and fluoride ions to magnesium ions preferably in a ratio of ( $\text{MeF}_4, \text{MeF}_6$  or/and  $\text{F}^-$ ) :  $\text{Mg}$  in the range from 0.1 : 1 to 10 : 1.

5. A process according to one of the preceding claims, characterized in that the composition comprises complex fluoride or/and fluoride ions to calcium ions preferably in a ratio of ( $\text{MeF}_4$ ,  $\text{MeF}_6$  or/and  $\text{F}^-$ ) : Ca in the range from 0.1 : 1 to 10 : 1.
6. A process according to one of the preceding claims, characterized in that the composition comprises nickel ions in the range up to 2 g/l.
7. A process according to one of the preceding claims, characterized in that the composition comprises chloride ions in the range up to 5 g/l.
8. A process according to one of the preceding claims, characterized in that the composition comprises sulfate ions in the range up to 2 g/l.
9. A process according to one of the preceding claims, characterized in that the composition comprises fluoroborate, in particular in the range from 0.1 to 5 g/l  $\text{BF}_4$ , particularly preferably in the range from 0.2 to 3 g/l.
10. A process according to one of the preceding claims, characterized in that the pH of the composition is kept in the range from 0.1 to 4.
11. A process according to one of the preceding claims, characterized in that a phosphate layer which has a layer thickness in the range from 0.02 to 15  $\mu\text{m}$  or/and a layer weight in the range from 0.5 to 25  $\text{g/m}^2$  is formed with the composition.
12. A process according to one of the preceding claims, characterized in that a phosphate layer which has an average edge length of the phosphate crystals of less than 20  $\mu\text{m}$  or even of less than 10  $\mu\text{m}$  and at the same time has a layer thickness with a layer weight in the range of 1.5 to 18  $\text{g/m}^2$ , in particular in the range from 2 to 15  $\text{g/m}^2$ , is formed with the composition.
13. A process according to one of the preceding claims, characterized in that after the formation of the phosphate layer at least one layer comprising lubricant is applied.
14. A process for coating surfaces of metallic objects with a phosphating solution, characterized in that the ratio of the pickling erosion on the metallic surface, measured in  $\text{g/m}^2$ , to the layer weight of the phosphate layer, measured in  $\text{g/m}^2$ , lies at values below 75%.

15. Aqueous phosphating solution which serves as a concentrate, as a bath solution or/and as a topping-up solution and which contains
- 8 to 100 g/l of phosphate, calculated as  $\text{PO}_4$ ,
  - 0.5 to 60 g/l of zinc ions,
  - 0 to 10 g/l of manganese ions,
  - 0 to 16 g/l of calcium ions,
  - 0 to 10 g/l of magnesium ions,
- wherein at least 0.1 g/l of calcium or/and magnesium ions are present,
- 0.05 to 10 g/l of nitroguanidine,
  - 0 to 2 g/l of nitrate,
  - 0.1 to 10 g/l in total of chlorate or/and peroxide ions,
- in total 0 to 16 g/l of complex fluoride ( $\text{MeF}_4$  or/and  $\text{MeF}_6$ ) of  $\text{Me} = \text{B}, \text{Si}, \text{Ti}, \text{Hf}$  or/and  $\text{Zr}$  and
- 0 to 5 g/l of fluoride ions
- wherein the total content of complex fluoride and fluoride ions is in the range from 0.1 to 18 g/l.
16. Use of a metallic object coated with a composition corresponding to one of the preceding claims in cold shaping, for a metal-rubber composite, as connecting elements with an adjusted coefficient of friction or as an element in building construction, in vehicle construction, in apparatus construction or in machine construction.